100

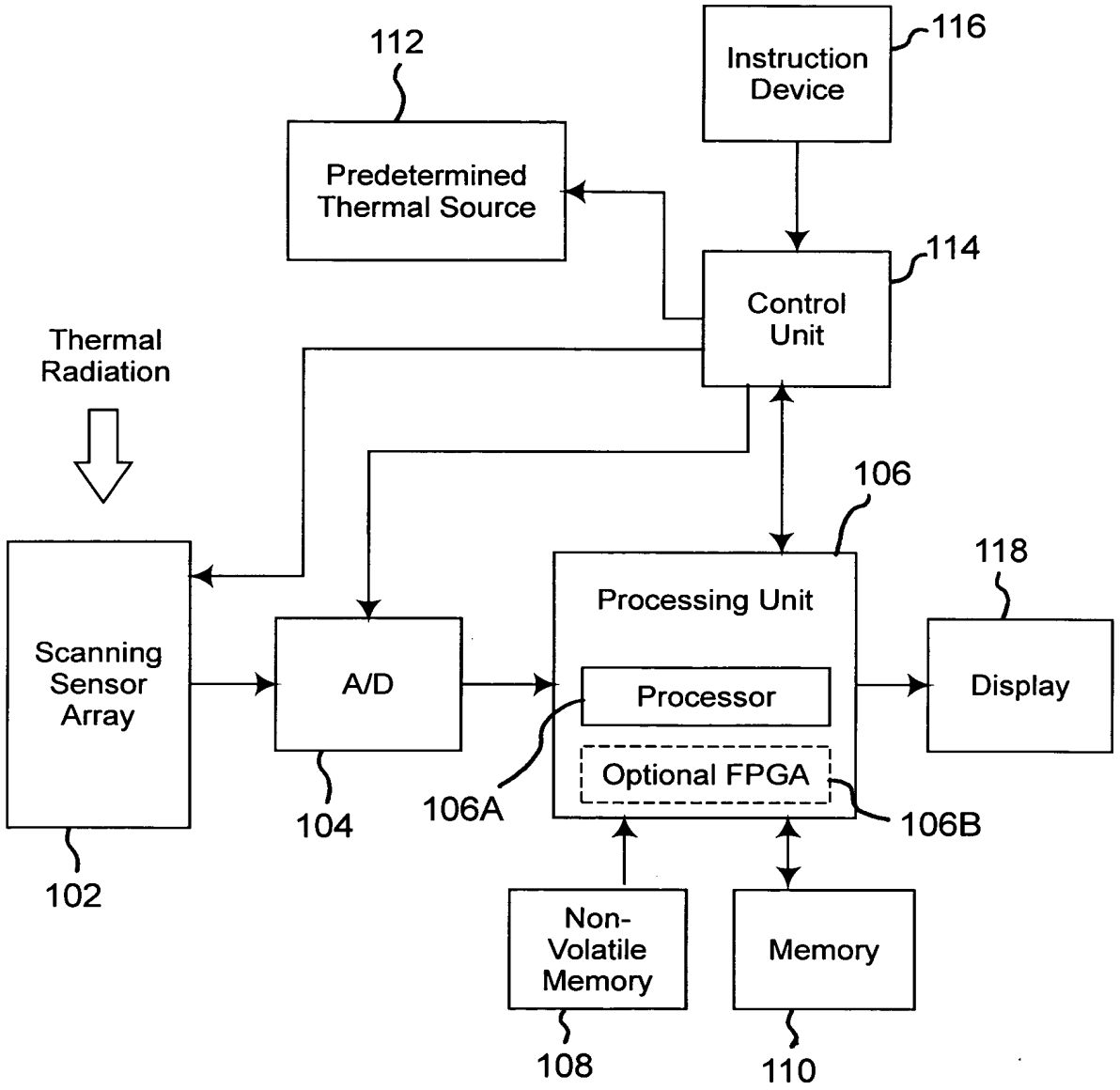
112
Predetermined Thermal Source
Instruction Device
116
Control Unit
114
Thermal Radiation
106
Processing Unit
118
Scanning Sensor Array
A/D
Processor
Display
Optional FPGA
104
106A
106B
102
Non-Volatile Memory
Memory
108
110

FIG. 1

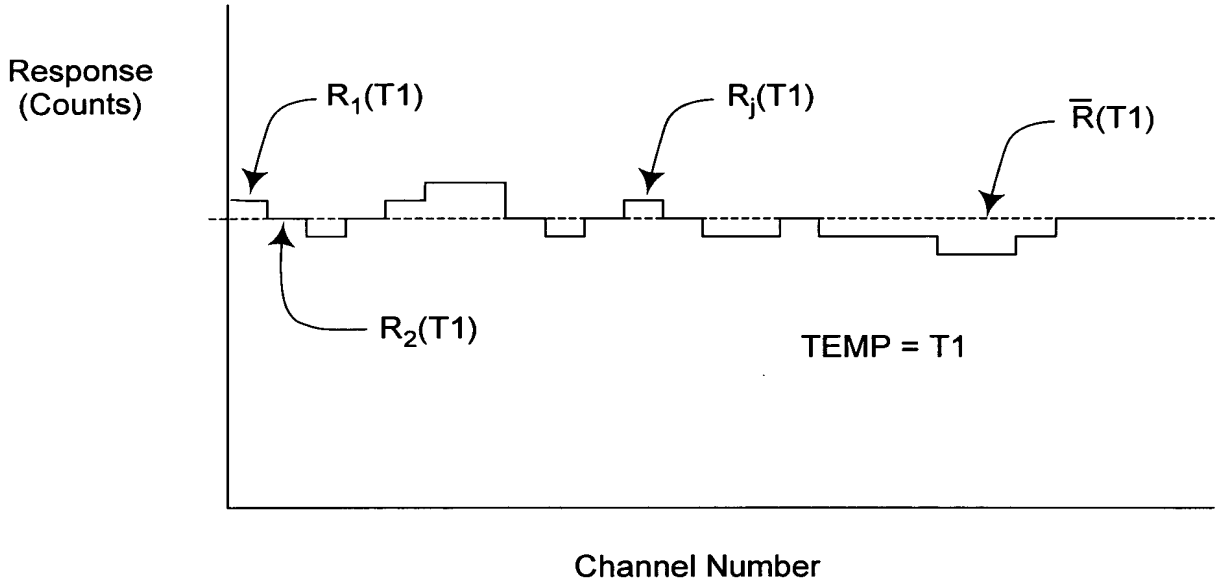
Response
(Counts)
$R_1(T1)$
$R_j(T1)$
$\overline{R}(T1)$
$R_2(T1)$
TEMP = T1
Channel Number

FIG. 2A

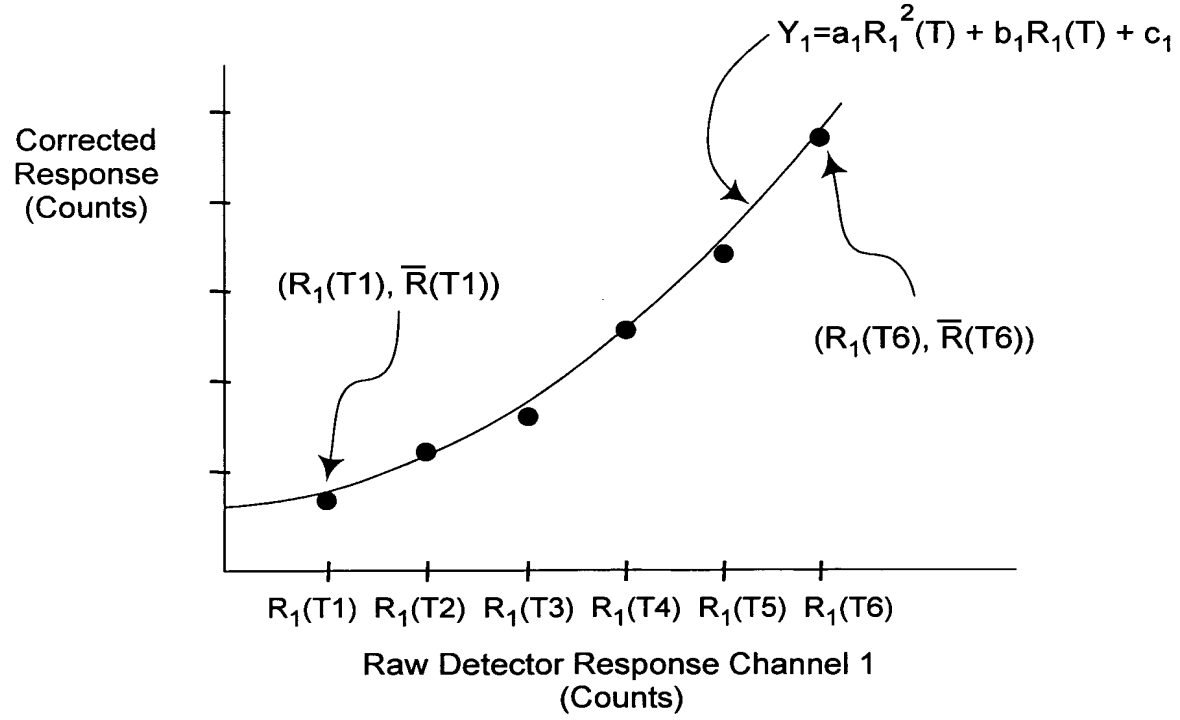
$Y_1=a_1R_1^2(T) + b_1R_1(T) + c_1$
Corrected
Response
(Counts)
$(R_1(T1), \overline{R}(T1))$
$(R_1(T6), \overline{R}(T6))$
$R_1(T1)$ $R_1(T2)$ $R_1(T3)$ $R_1(T4)$ $R_1(T5)$ $R_1(T6)$
Raw Detector Response Channel 1
(Counts)

FIG. 2B

300

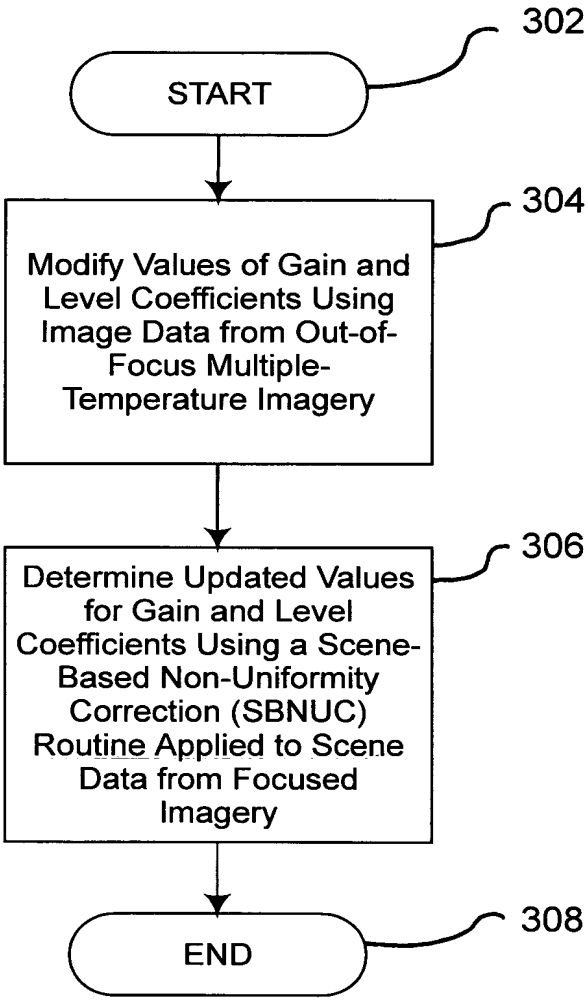
302
START
304
Modify Values of Gain and Level Coefficients Using Image Data from Out-of-Focus Multiple-Temperature Imagery
306
Determine Updated Values for Gain and Level Coefficients Using a Scene-Based Non-Uniformity Correction (SBNUC) Routine Applied to Scene Data from Focused Imagery
308
END

FIG. 3

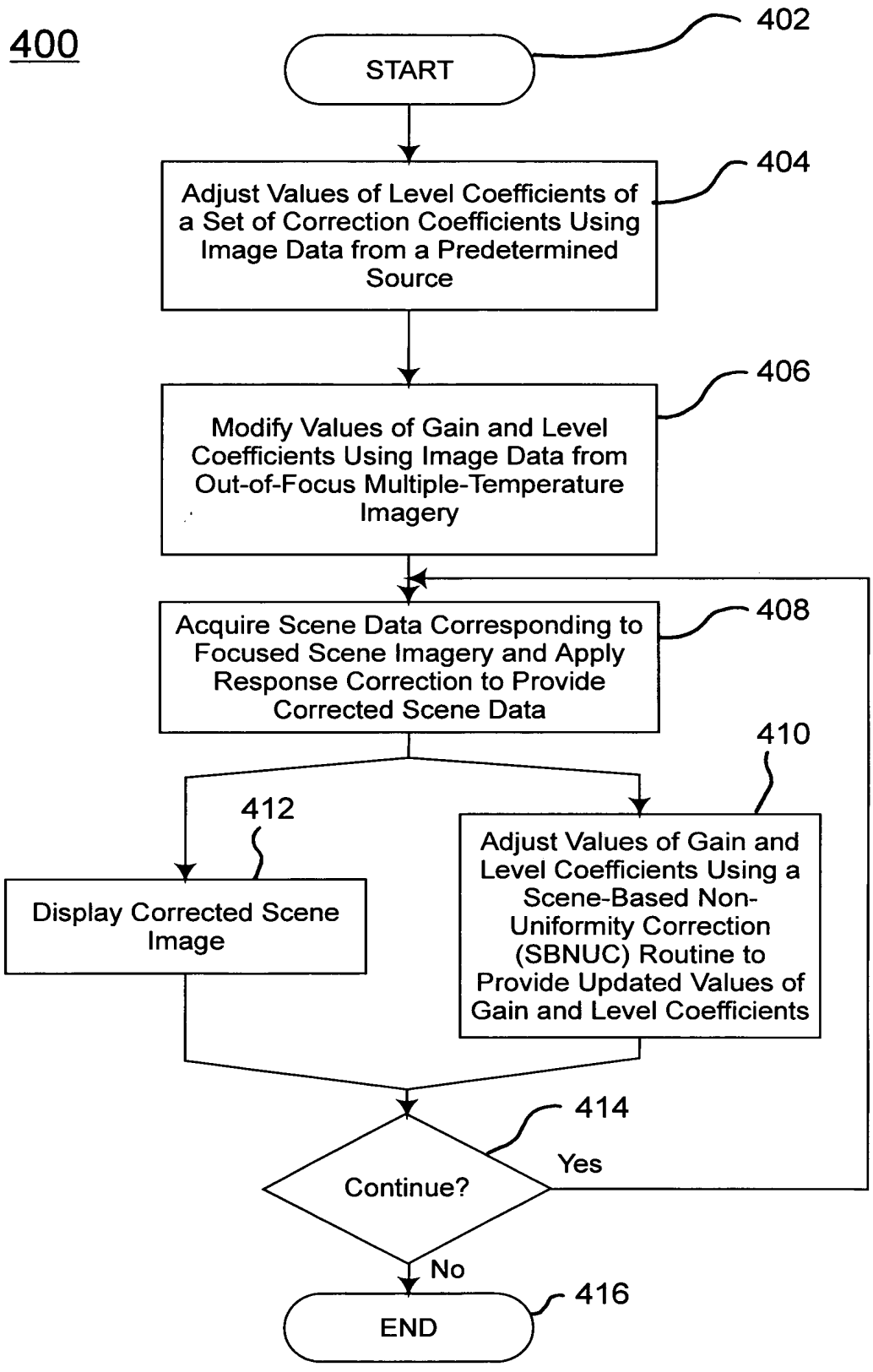
400
START
402
Adjust Values of Level Coefficients of a Set of Correction Coefficients Using Image Data from a Predetermined Source
404
Modify Values of Gain and Level Coefficients Using Image Data from Out-of-Focus Multiple-Temperature Imagery
406
Acquire Scene Data Corresponding to Focused Scene Imagery and Apply Response Correction to Provide Corrected Scene Data
408
410
412
Display Corrected Scene Image
Adjust Values of Gain and Level Coefficients Using a Scene-Based Non-Uniformity Correction (SBNUC) Routine to Provide Updated Values of Gain and Level Coefficients
414
Continue?
Yes
No
END
416

FIG. 4

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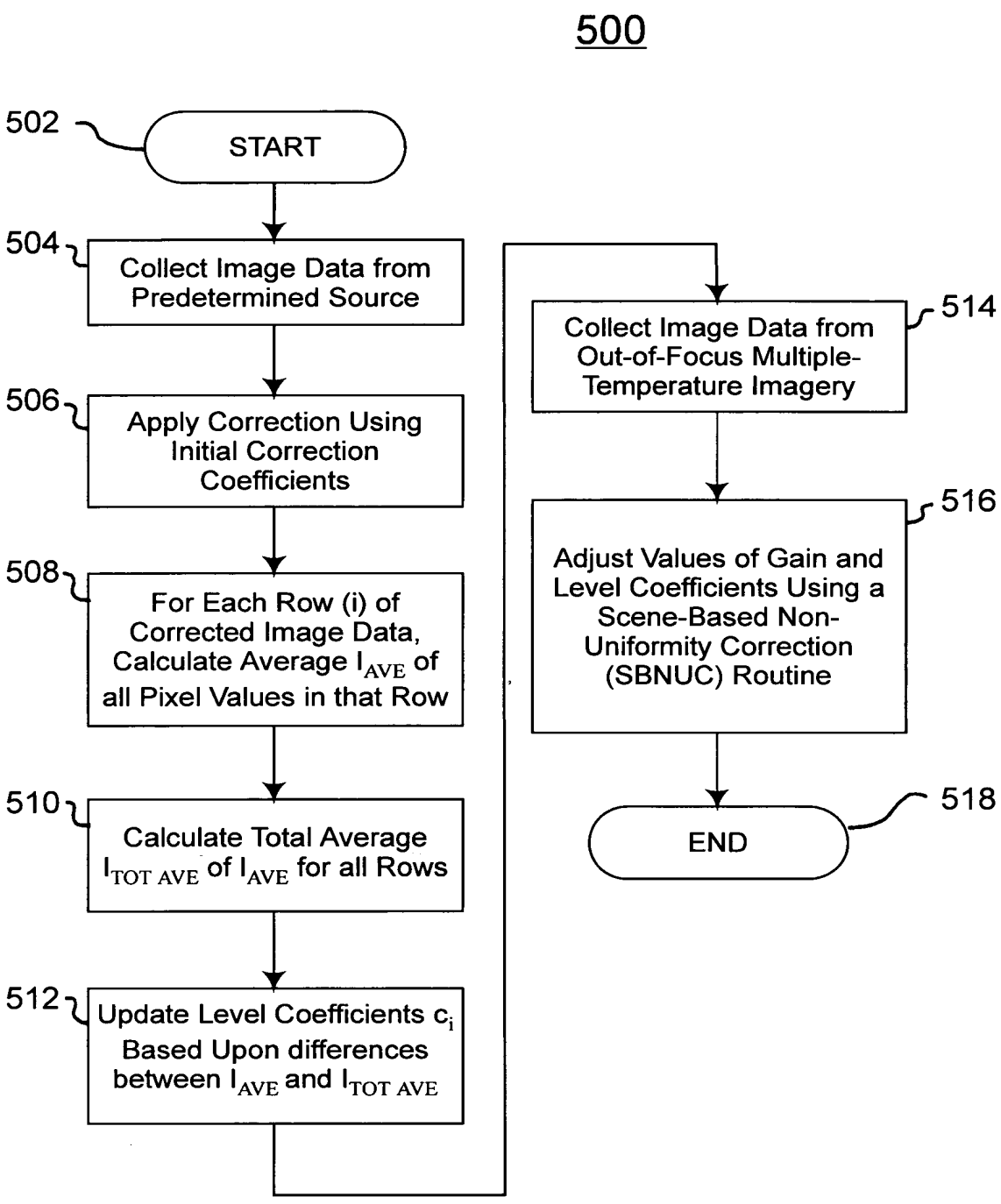


FIG. 5

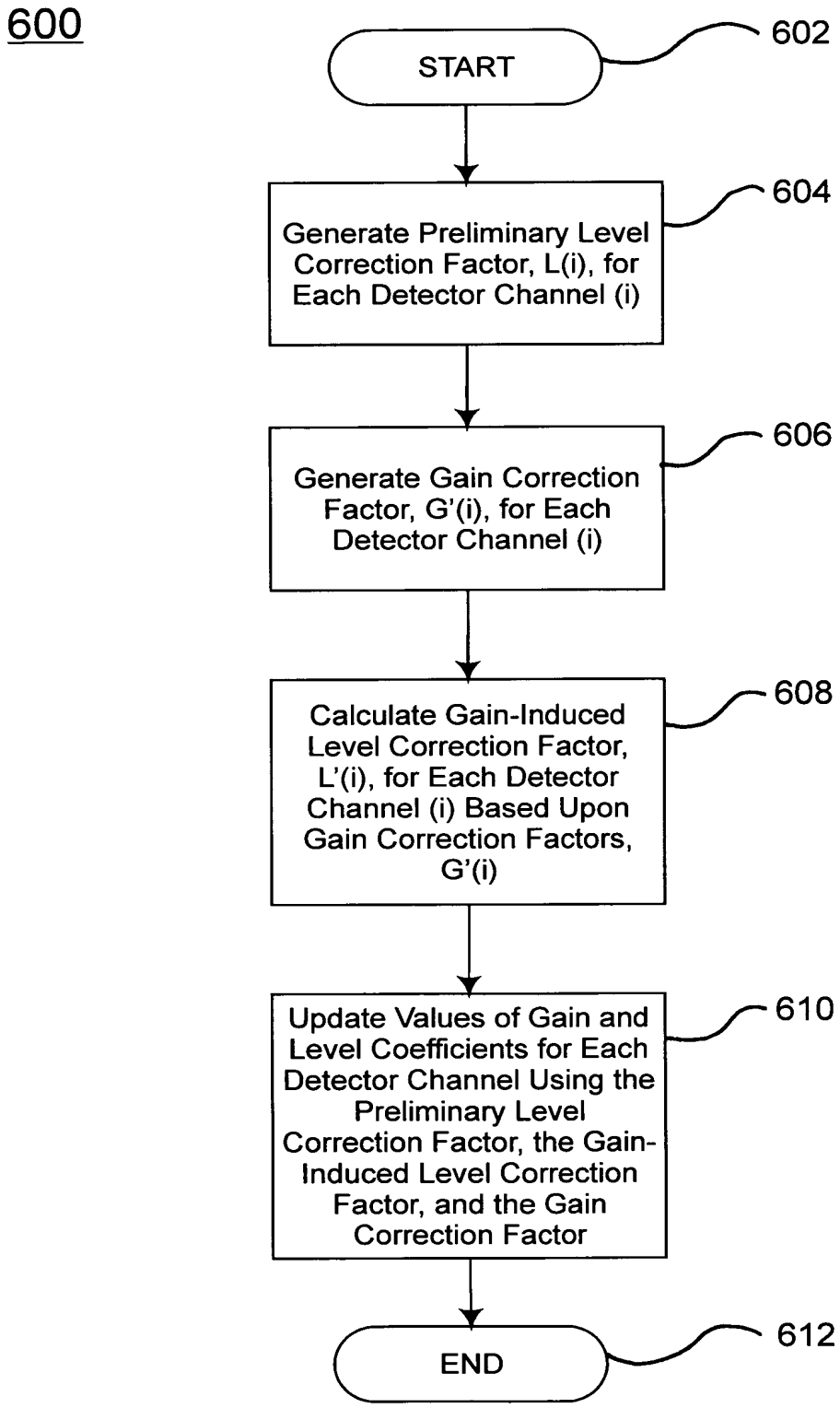

600
START
602
Generate Preliminary Level Correction Factor, L(i), for Each Detector Channel (i)
604
Generate Gain Correction Factor, G'(i), for Each Detector Channel (i)
606
Calculate Gain-Induced Level Correction Factor, L'(i), for Each Detector Channel (i) Based Upon Gain Correction Factors, G'(i)
608
Update Values of Gain and Level Coefficients for Each Detector Channel Using the Preliminary Level Correction Factor, the Gain-Induced Level Correction Factor, and the Gain Correction Factor
610
END
612

FIG. 6

APPLN. FILING DATE: APRIL 25, 2001
TITLE: SCENE-BASED NON-UNIFORMITY CORRECTION FOR DETECTOR ARRAYS
INVENTOR(S): TIMOTHY ALDERSON ET AL.
APPLICATION SERIAL NO: N/A
SHEET 7 of 15

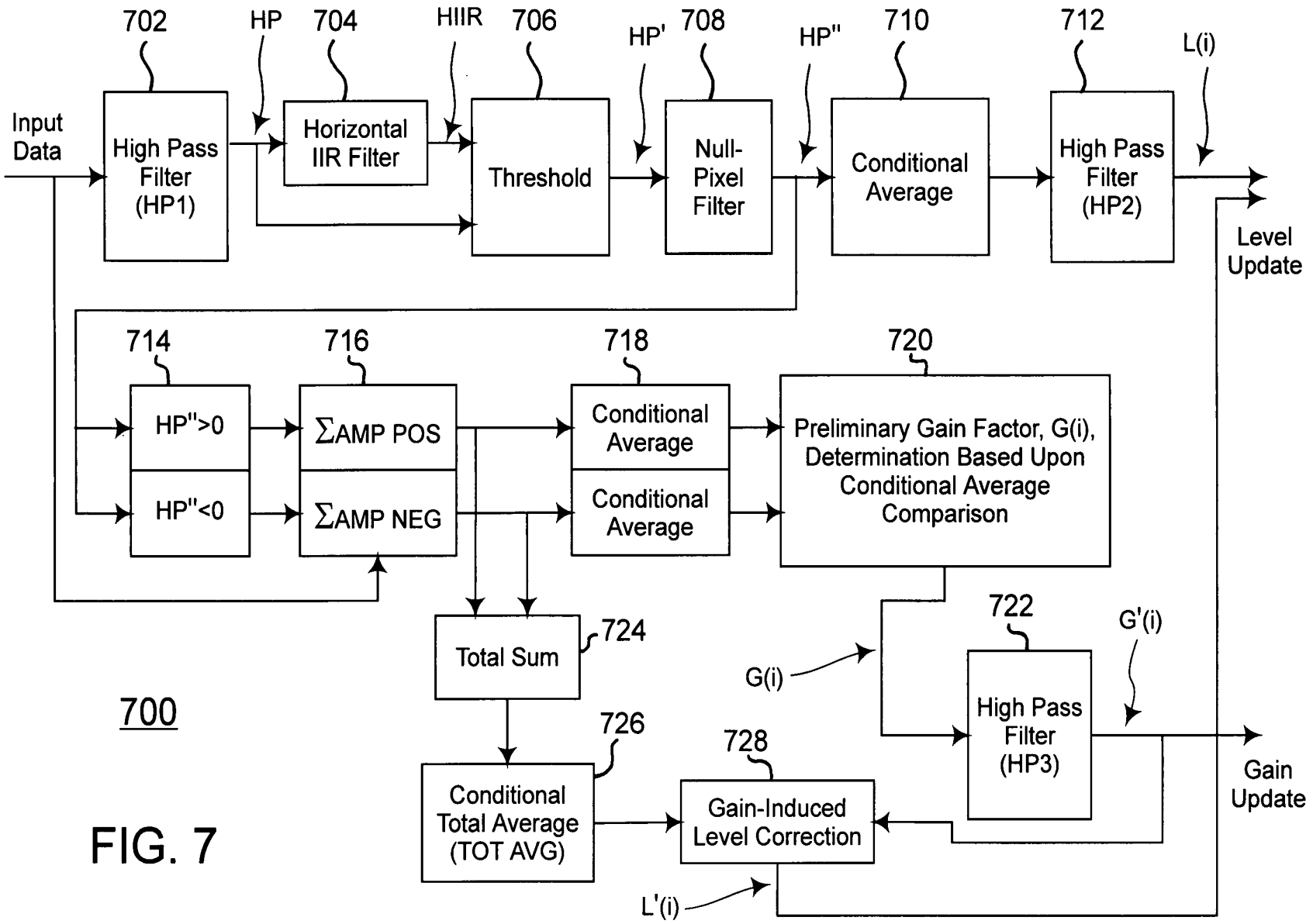


FIG. 7

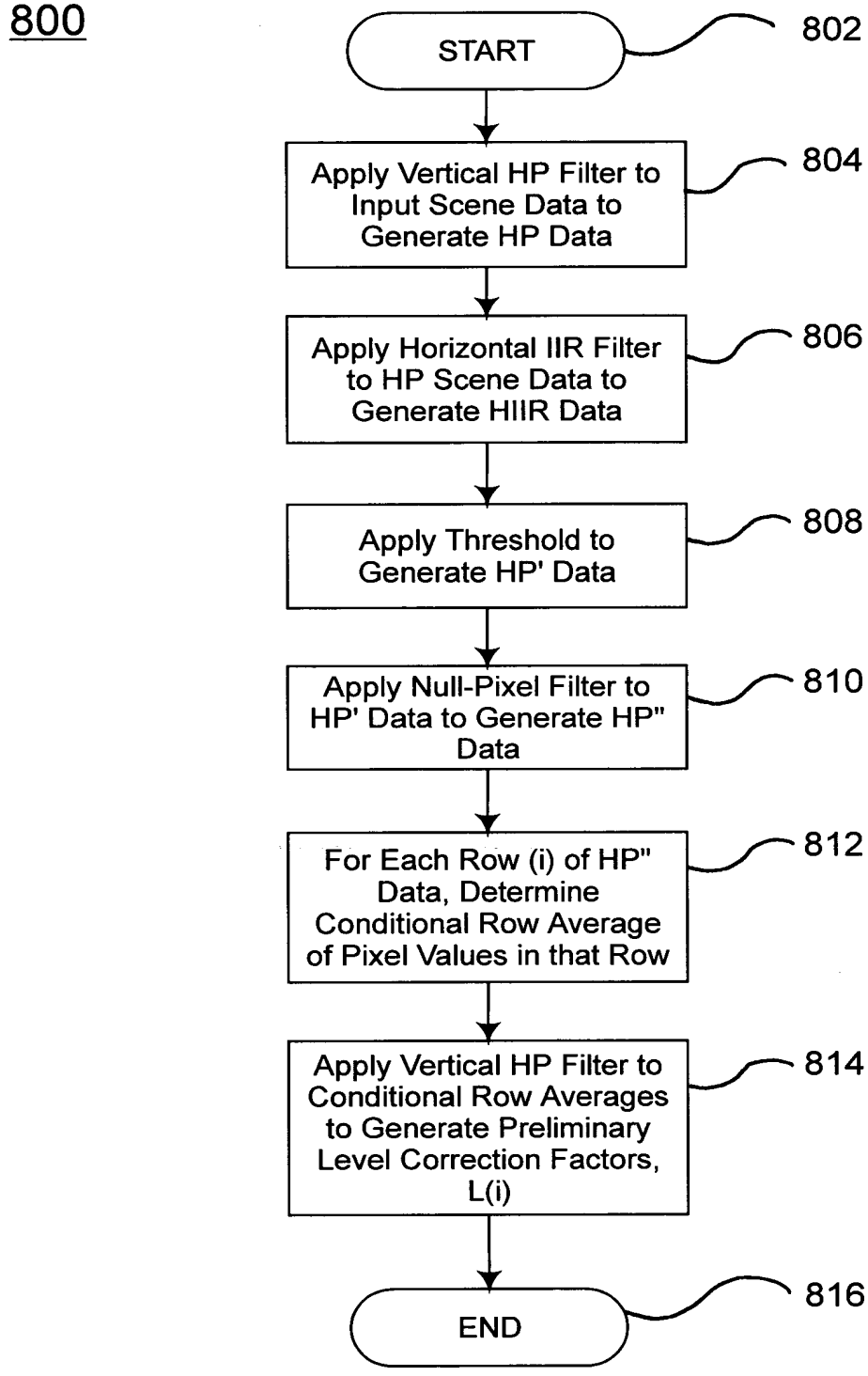

800
START
802
Apply Vertical HP Filter to Input Scene Data to Generate HP Data
804
Apply Horizontal IIR Filter to HP Scene Data to Generate HIIR Data
806
Apply Threshold to Generate HP' Data
808
Apply Null-Pixel Filter to HP' Data to Generate HP" Data
810
For Each Row (i) of HP" Data, Determine Conditional Row Average of Pixel Values in that Row
812
Apply Vertical HP Filter to Conditional Row Averages to Generate Preliminary Level Correction Factors, L(i)
814
END
816

FIG. 8

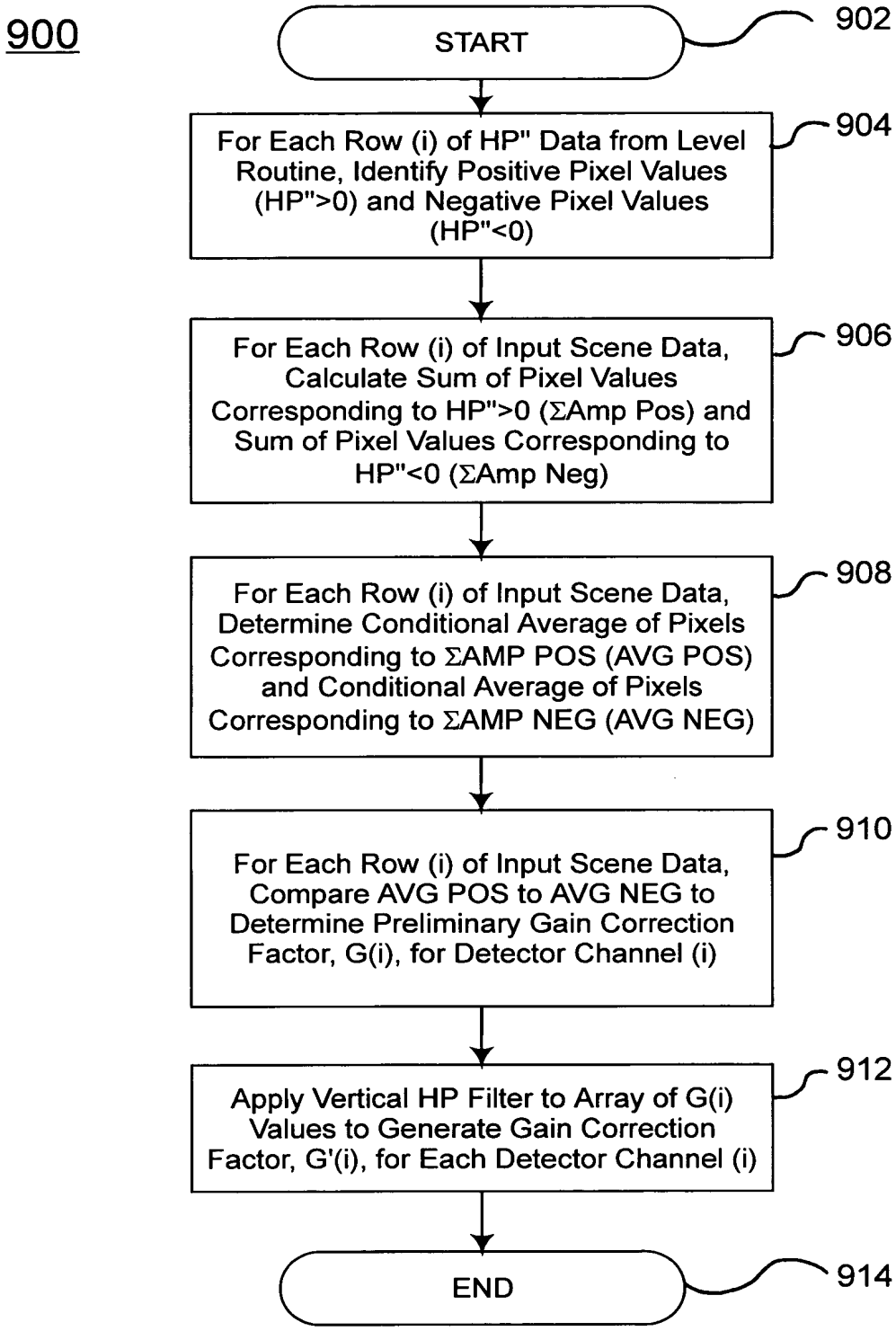

900
START
902
For Each Row (i) of HP" Data from Level Routine, Identify Positive Pixel Values (HP">0) and Negative Pixel Values (HP"<0)
904
For Each Row (i) of Input Scene Data, Calculate Sum of Pixel Values Corresponding to HP">0 (ΣAmp Pos) and Sum of Pixel Values Corresponding to HP"<0 (ΣAmp Neg)
906
For Each Row (i) of Input Scene Data, Determine Conditional Average of Pixels Corresponding to ΣAMP POS (AVG POS) and Conditional Average of Pixels Corresponding to ΣAMP NEG (AVG NEG)
908
For Each Row (i) of Input Scene Data, Compare AVG POS to AVG NEG to Determine Preliminary Gain Correction Factor, G(i), for Detector Channel (i)
910
Apply Vertical HP Filter to Array of G(i) Values to Generate Gain Correction Factor, G'(i), for Each Detector Channel (i)
912
END
914

FIG. 9

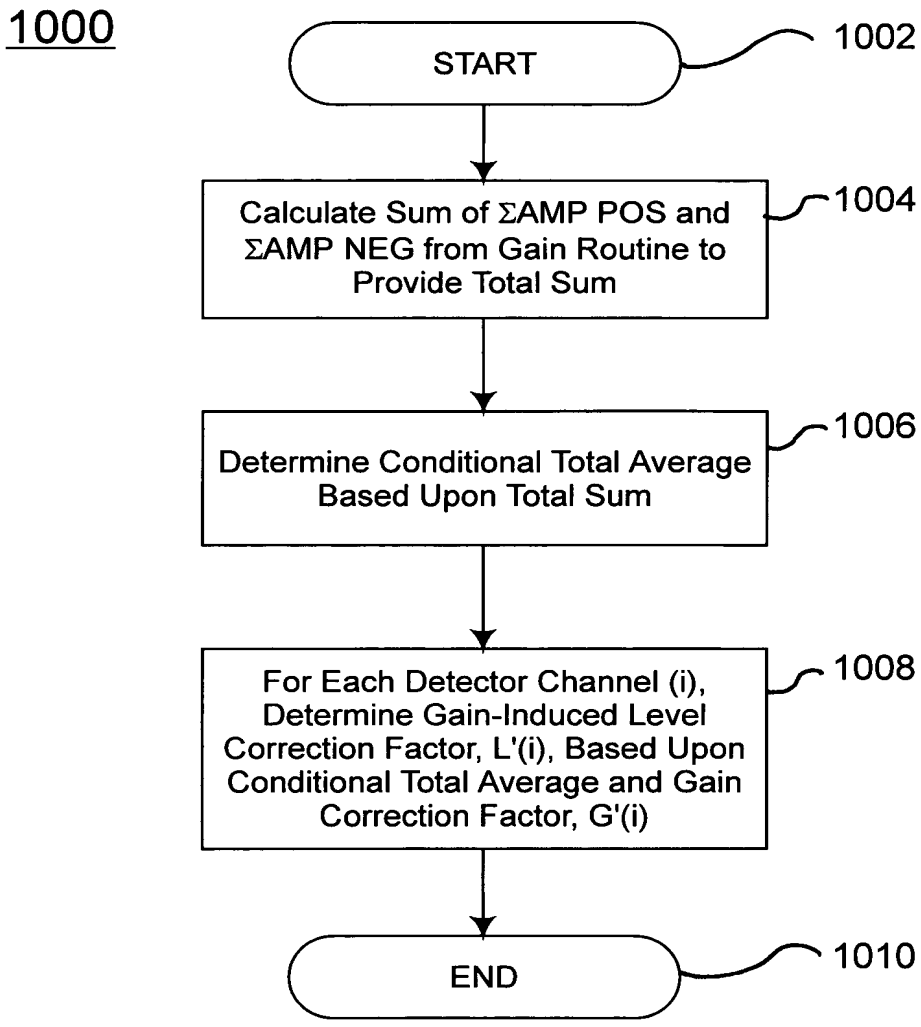

1000
START
1002
Calculate Sum of ΣAMP POS and ΣAMP NEG from Gain Routine to Provide Total Sum
1004
Determine Conditional Total Average Based Upon Total Sum
1006
For Each Detector Channel (i), Determine Gain-Induced Level Correction Factor, L'(i), Based Upon Conditional Total Average and Gain Correction Factor, G'(i)
1008
END
1010

FIG. 10

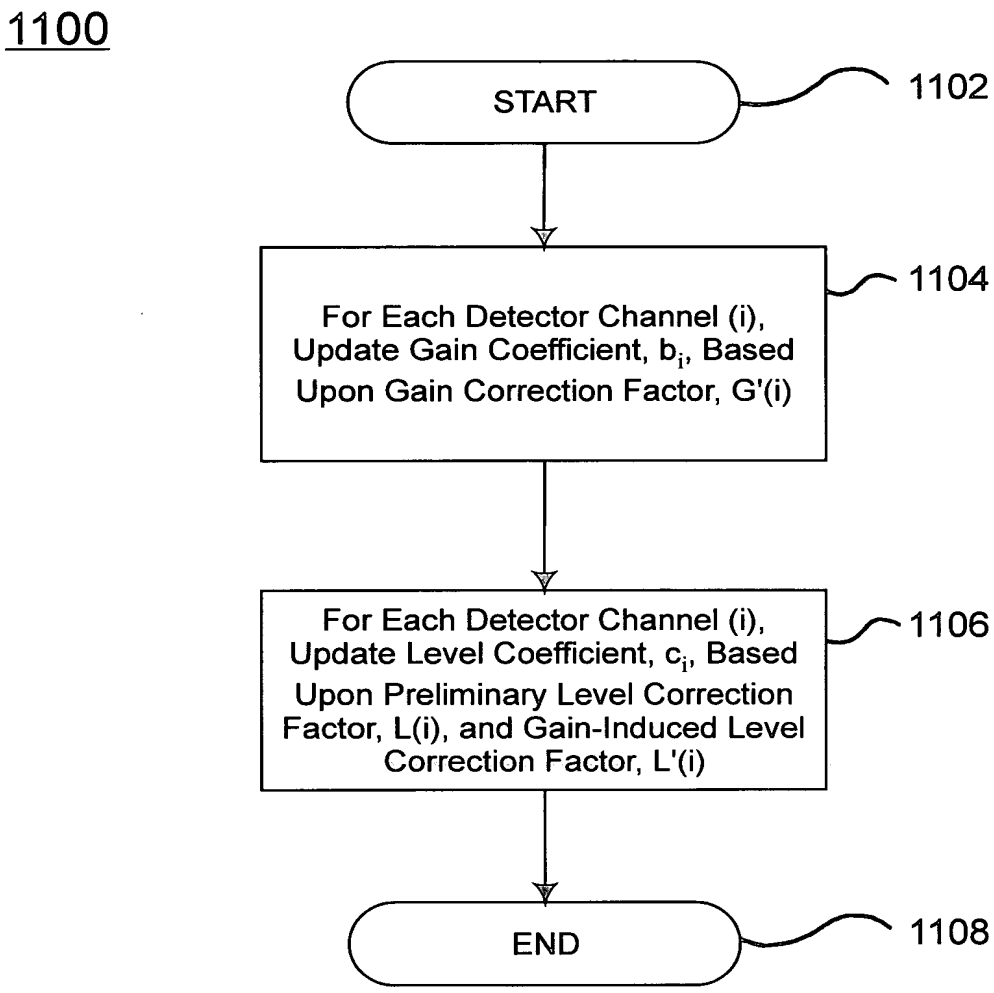

1100
START
1102
For Each Detector Channel (i), Update Gain Coefficient, b_i, Based Upon Gain Correction Factor, G'(i)
1104
For Each Detector Channel (i), Update Level Coefficient, c_i, Based Upon Preliminary Level Correction Factor, L(i), and Gain-Induced Level Correction Factor, L'(i)
1106
END
1108

FIG. 11

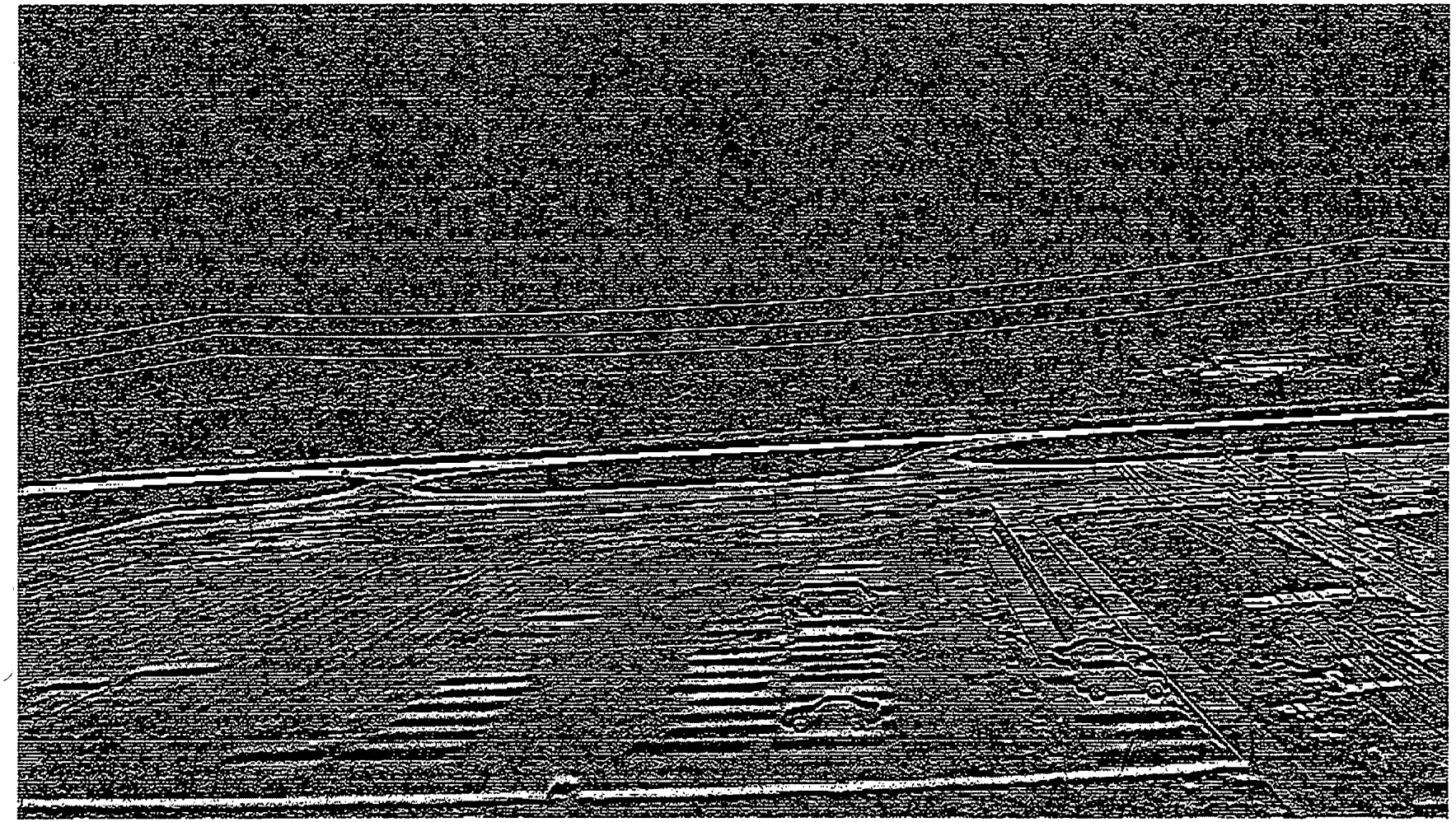
Original Image

FIG. 12

T052h0-0260h360

HP of Original Image

FIG. 13



TOSCHO" 020Ohabo

Thresholded Image

FIG. 14

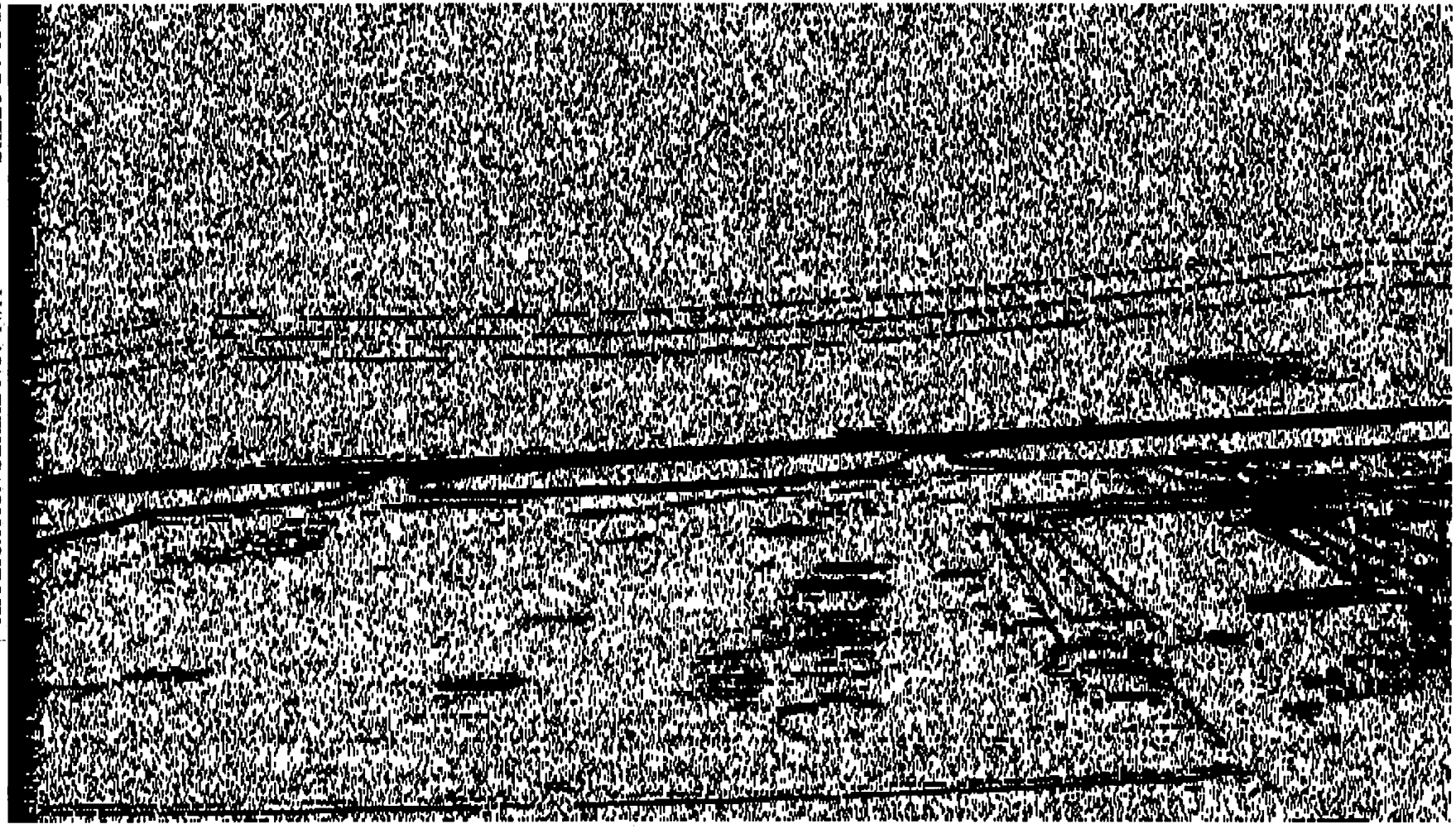
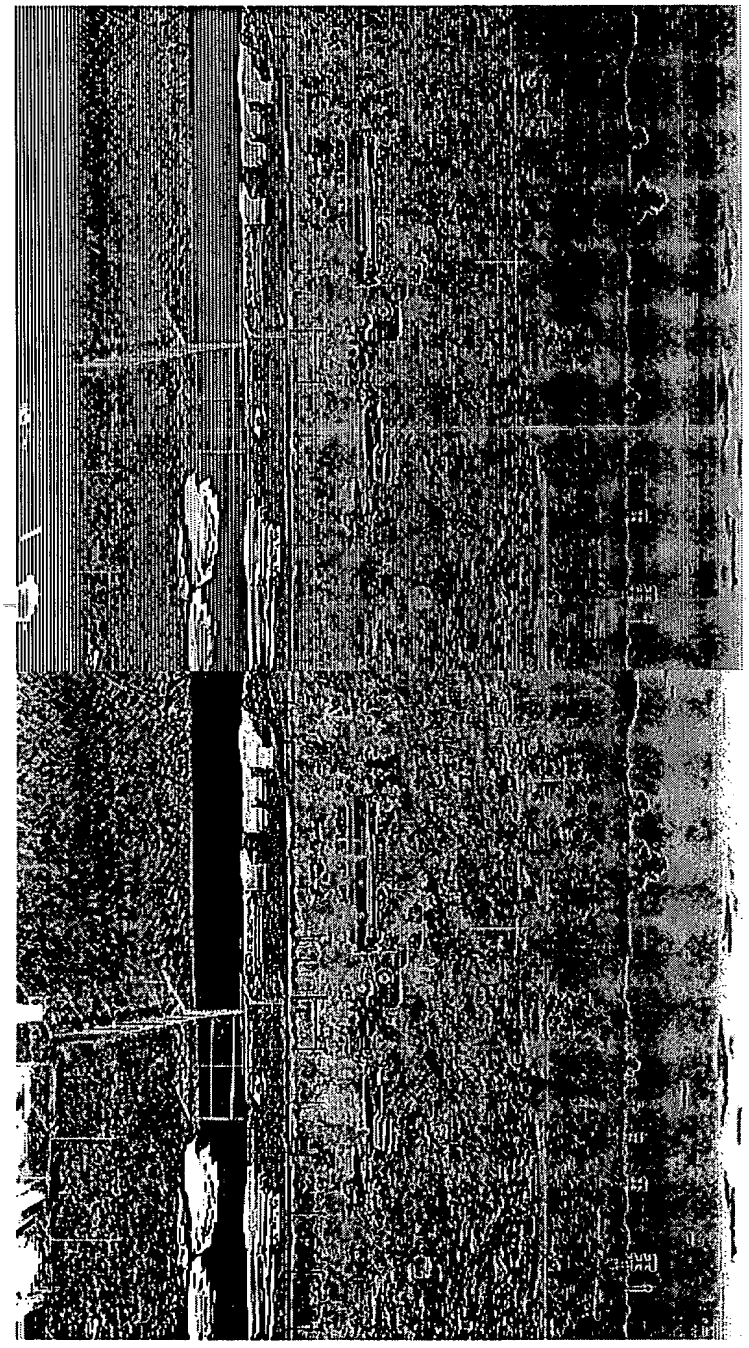


FIG. 15



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